

CLAIMS

WHAT IS CLAIMED IS:

1. A method for fabricating a semiconductor device, comprising the steps of:
 - 5 (a) forming at least in a part of a semiconductor substrate a dopant-containing semiconductor layer for absorbing an infrared ray; and
 - (b) thermally processing the semiconductor substrate at a processing temperature by irradiating the semiconductor substrate with an infrared ray.
- 10 2. The method of Claim 1, wherein the step (b) comprises the steps of:
 - (b1) detecting infrared radiation emitted from the semiconductor substrate; and
 - (b2) measuring the temperature of the semiconductor substrate based on the intensity of the infrared radiation, and controlling the output of the infrared ray.
- 15 3. The method of Claim 1, wherein the semiconductor substrate is a silicon substrate, and
wherein the wavelength of the infrared ray is not less than 0.2 μ m nor more than 5.0 μ m.
- 20 4. The method of Claim 1, wherein the step (b) further comprises the step of maintaining the substrate at a temperature lower than the processing temperature prior to the thermal processing to be performed at the processing temperature, thereby stabilizing the substrate temperature.
- 25 5. The method of Claim 1, wherein in the step of stabilizing the substrate

temperature, the substrate temperature is stabilized at 700°C or less.

6. The method of Claim 1, wherein in the step of stabilizing the substrate temperature, the substrate temperature is stabilized at 600°C or less.

5

7. The method of Claim 2, wherein in the step (b1), infrared radiation emitted from the bottom surface of the semiconductor substrate is detected.

8. The method of Claim 1, wherein the semiconductor layer provided in the step (a)
10 is formed over the entire surface of the semiconductor substrate in plan view.

9. The method of Claim 1, wherein an average concentration of the dopant contained in the semiconductor layer is not less than $3 \times 10^{18} \text{ cm}^{-3}$ nor more than $5 \times 10^{22} \text{ cm}^{-3}$
3

15

10. The method of Claim 1, wherein the thickness of the semiconductor layer is $1 \mu\text{m}$ or more.

11. The method of Claim 1, wherein the thickness of the semiconductor layer is
20 $3 \mu\text{m}$ or more.

12. The method of Claim 1, wherein the step (a) comprises the step of thermally diffusing a dopant into the semiconductor substrate using a gas containing a dopant in its molecules, and

25 wherein the semiconductor layer is formed in a lower part of the semiconductor

substrate.

13. The method of Claim 1, wherein in the step (a), the semiconductor layer is formed by dopant ion implantation.

5

14. The method of Claim 1, wherein in the step (a), the dopant-containing semiconductor layer is epitaxially grown by a CVD process.

15. The method of Claim 1, wherein the step (a) further comprises the step of forming the semiconductor substrate by bonding a plurality of semiconductor substrates to each other, and

wherein at least one of the plurality of substrates has a semiconductor layer.

16. The method of Claim 1, wherein the method further comprises, after the step (a), the step of forming a semiconductor element on the semiconductor substrate, and

wherein the step (b) is performed as a part of the step of forming a semiconductor element on the semiconductor substrate.

20